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MODEL DS-109 SERIES

DOUBLE-STUB TUNERS

—

INSTRUCTION MANUAL

WEINSCHEL ENGINEERING

GAITHERSBURG, MARYLAND

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CAUTION

MODEL DS-109M ONLY

When retracting the stubs for any reason, allow at least an inch of the stub to remain exposed above the collet. Never push the stubs all the way down; to do so will damage the internal contacts.

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DESIGNERS AND MANUFACTURERS OF PRECISION MICROWAVE EQUIPMENT

WEINSCHEL ENGINEERING

GAITHERSBURG, MARYLAND

MODEL DS-109 SERIES DOUBLE-STUB TUNERS

INSTRUCTIONS

The Model DS-109 Series of Double-Stub Tubers is a line of laboratory instruments designed to tune out mismatch conditions in coaxial systems. Ruggedly constructed of corrosion-resistant materials, these devices have been thoroughly tested to assure conformance with mechanical and electrical specifications.

ASSEMBLY

Weinschel Double-Stub Tuners are shipped disassembled. To assemble and use, check the plate on the base of the tuner and determine which stub positions to use for a particular frequency. Assemble the tuner as follows:

1. Hold the stub vertically about three inches above the port.

2. Slide the center conductor down and insert into the tapped hole in the base center conductor. Tighten hand-tight.

3. Slide the stub down until the threads engage with the tapped hole of the port. Screw the stub down hand-tight.

4. Insert a thin screwdriver through the end of the stub and screw the center conductor down firmly. Check the stub to make sure it is firmly seated.

5. Repeat with the other stub.

USE

Double-Stub Tuners are used to reduce mismatch as great as seven or eight to one as follows:

1. Be sure the proper ports have been selected for the frequency in use.

2. Adjust the stubs individually while checking convergence on the system VSWR indicator. This is shown as the VSWR approaches 1:1. It is best to adjust the stubs alternately in small increments. This will minimize overshoot and result in faster tuning.

3. When changing frequencies, consult the base chart for correct stub positions.

HANDLING

When handling and using a tuner, make sure the stub center conductor is firmly screwed into the base center conductor, and that the stub is screwed down hand-tight. Normal use should not damage the tuner. When transporting the tuner, do NOT carry it by the stubs; this can cause bending of the tubes with resultant poor performance. Do NOT use pliers or other tools for tightening the various knurled thumb-screws. The tuner will perform satisfactorily with all adjustments hand-tight. If intermittent adjustments occur, refer to the maintenance paragraph below.

MAINTENANCE

The DS-109 Series Double-Stub Tuners require minimum care. Tuners should not be subjected to extremely dusty or dirty conditions as accumulations of foreign matter can affect the tuning ease, resolution, and repeatability, especially of the micrometer types. Should erratic or nonrepeatable adjustments occur, experience has shown the following procedures to be effective:

1. Disassemble the stubs and clean all parts with a good commercial low-residue solvent such as toluene or pax.

2. Sliding contact fingers should be checked for wear. Normal wear is virtually the only cause of tuning problems, and can be corrected in mild cases by slightly spreading or compressing the tines for good mechanical and electrical performance. Should wear become excessive, replacement parts should be ordered from the factory.

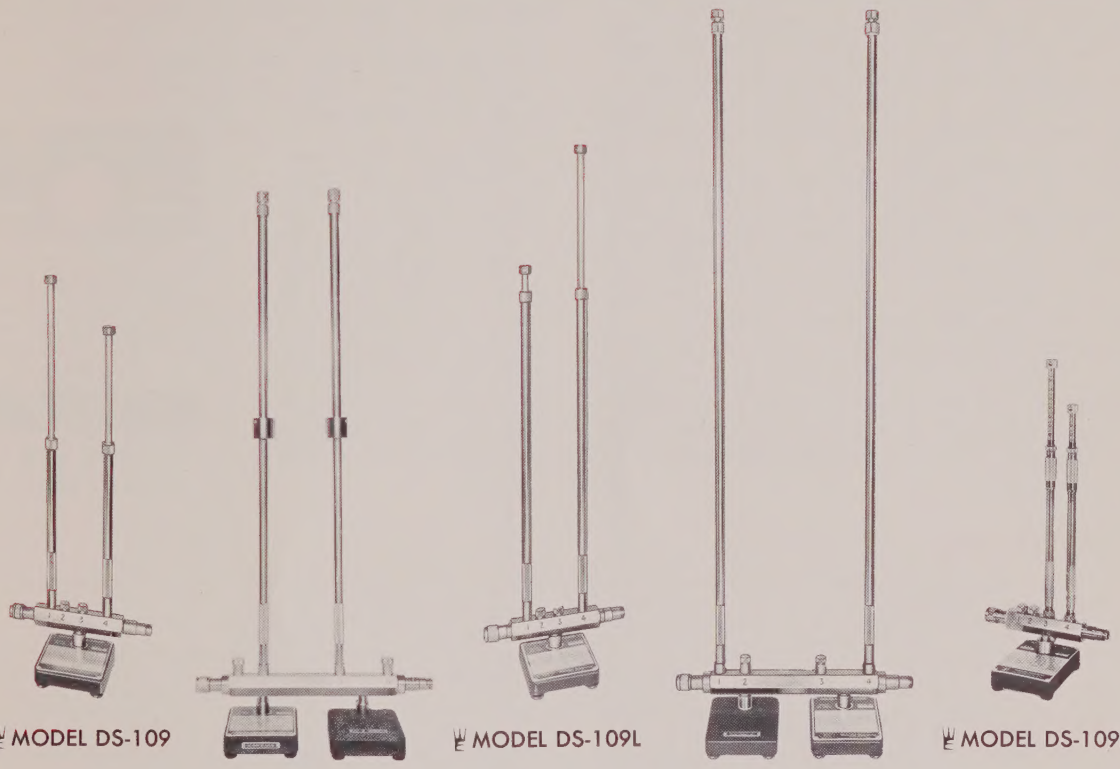
3. After cleaning and adjusting the tuner, lubricate the sliding and contact surfaces with an extremely thin film of a good grade conductive lubricant such as Moly-Cote-G, Lube-Rex, etc.

4. Should problems still exist, return the unit to the factory for repair.

DOUBLE STUB TUNERS

SERIES DS-109

40 MHz-13.0 GHz



MODEL DS-109 | MODEL DS-109H* | MODEL DS-109L | MODEL DS-109LL** | MODEL DS-109M

FEATURES

- **COLLET TYPE LOCKS**—Each tuner is equipped with collet type locks to prevent accidental movement of the stubs after adjustments are made.
- **ADJUSTABLE DISTANCE BETWEEN STUBS**—Each tuner has four possible stub locations, enabling the stubs to be set at the most favorable of six available spacings to permit rapid convergence during the matching process.
- **ADJUSTABLE HEIGHT OF CONNECTORS**—The tuners are mounted on pedestals, and the vertical spacing between the pedestal and the center line of the connectors is adjustable. The tuners can easily be set-up in line with practically all commercially available slotted lines and still have their weight completely supported without mechanical load on the connectors.
- **STAINLESS STEEL CLOSE TOLERANCE CONNECTORS**—These tuners are equipped with Type N connectors made of long-wearing stainless steel.
- **FINE TUNING** — The micrometer adjustment of resettable Model DS-109M provides an excellent fine tuning control, permitting easy location of the optimum balance setting.
- **ACCURATE RAPID RESETTING**—Once a tuning setting has been determined on Model DS-109M, it can be repeated by adjusting the coarse and fine settings to their previously determined positions. Settings made in this manner repeat within a range of .005".

* U. S. Patent 3,242,444

** U. S. Patent 2,981,169

APPLICATIONS

Double stub tuners are standard microwave accessories used both in the laboratory and on the production line. The most common application is to "match" or transform a load impedance to the impedance of a transmission line feeding the load so as to maintain a low standing wave ratio on the line. They are also used extensively to optimize the transfer from a generator to a load.

A more specialized application for a resettable model such as the DS-109M is the matching of a transition from a slotted line to a cable. This is a common problem when measuring the VSWR of cable connectors. Here the reset feature is indispensable if such measurements are to be made over a band of frequencies. Using the DS-109M, the transition is first matched at each test frequency and the stub settings recorded. The connector is then inserted and the tuner settings restored at each test frequency to make the connector VSWR measurement.

There are many other specialized applications for stub tuners. In all applications, the resettable feature and the vernier control on the Model DS-109M increases the usefulness of the tuner as well as the efficiency of the operator.

DESCRIPTION

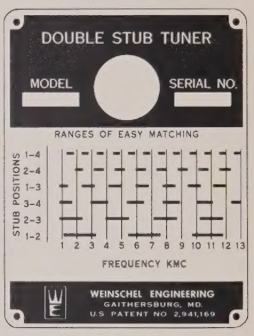
To match a wide range of impedances, Ψ tuners are provided with adjustable spacing between the stubs. A spacing can be selected for each frequency to obtain a rapid convergence to a match. Each tuner is provided with a permanently mounted instruction plate indicating the preferred stub position for rapid convergence in a particular frequency range. In those rare cases where the load impedance falls outside the range of the tuner, it can be brought into range by inserting a quarter wavelength line between the tuner and the load. Due to the wide spacing available, these tuners are useful below their low frequency limits with some deterioration in the rapidity of convergence and the resulting convenience in use.

Another factor of importance is the ease with which adjustments can be made. The stubs are designed so that the sliding contacts are removed from the high current point of the short, thus greatly reducing the noise produced when the short is in motion. Collet type locks are provided to prevent accidental movement of the stubs after they have been adjusted.

The Ψ Model DS-109H differs from the other models in that it utilizes a helical inner conductor in both the stubs and the body between the stubs giving the unit an electrical length much greater than its mechanical length. A 53 centimeter travel of the stubs corresponds to a change of more than 380 centimeters in their electrical length.

The Ψ Model DS-109M Double Stub Tuner is similar in construction to the DS-109 but is made with two resettable adjustments on each stub. Circumferential grooves at 0.25″ intervals along each stub provide a fast and accurate coarse setting. This adjustment can then be locked using a sliding collet. A micrometer type control with a 0.5″ range calibrated in 0.001″ increments is used for fine tuning. With dual adjustment the mechanical setting can be repeated quickly and easily with a precision of ±0.0025″. The micrometer control serves another extremely useful purpose since it makes it easy to move the stub smoothly and in very small increments to permit true fine tuning of the balance point.

All Ψ Double Stub Tuners are provided with stands having a height adjustment to permit convenient use with practically any commercially available slotted line. This feature permits supporting the weight of the tuner on the stand, rather than attempting to support this weight through connectors, thus avoiding one source of instability in measurements.



Ψ MODEL DS-109
SAMPLE NAMEPLATE

SPECIFICATIONS

Model Number	DS-109	DS-109H	DS-109L	DS-109LL	DS-109M
Frequency Range	0.75-13.0 GHz	40-400 MHz	0.4-4.0 GHz	0.2-2.0 GHz	0.75-13.0 GHz
Impedance Match (to 50 Ω line within specified frequency range)	Any impedance less than 50 Ω and any impedance more than 50 Ω resulting in VSWR less than 7.0	Any impedance less than 50 Ω and any impedance more than 50 Ω resulting in VSWR less than 7.0	Any impedance less than 50 Ω and any impedance more than 50 Ω resulting in VSWR less than 7.0	Any impedance less than 50 Ω and any impedance more than 50 Ω resulting in VSWR less than 7.0	Any impedance less than 50 Ω and any impedance more than 50 Ω resulting in VSWR less than 7.0
Line Impedance	50 Ω	50 Ω	50 Ω	50 Ω	50 Ω
Length of Stub Travel	20.5 cm	53 cm	38 cm	76 cm	20.5 cm
Overall Length	6⅛″	12″	6⅛″	12″	6⅛″
Overall Height	12½″ to 20¾″	25⅛″ to 48¾″	20½″ to 35¾″	36¼″ to 66½″	12½″ to 20¾″
Connectors	Stainless steel Type N, one male, one female	Stainless steel Type N, one male, one female	Stainless steel Type N, one male, one female	Stainless steel Type N, one male, one female	Stainless steel Type N, one male, one female
Height of Connector from Base	2⅜″ to 3¼″	2⅞″ to 3¼″	2⅜″ to 3¼″	2⅜″ to 3¼″	2⅜″ to 3¼″
Net Weight	5 lbs.	12 lbs.	6 lbs.	12 lbs.	5 lbs.
Shipping Weight	8 lbs.	15 lbs.	9 lbs.	15 lbs.	8 lbs.
Price	$150	$250	$165	$190	$250

TERMS: are net 30 days, subject to approval of credit. All prices are F.O.B. Gaithersburg, Maryland, and include commercial packing for domestic shipment within the continental United States. Prices and specifications are subject to change without notice.

DESIGNERS AND MANUFACTURERS OF PRECISION MICROWAVE EQUIPMENT

WEINSCHEL ENGINEERING

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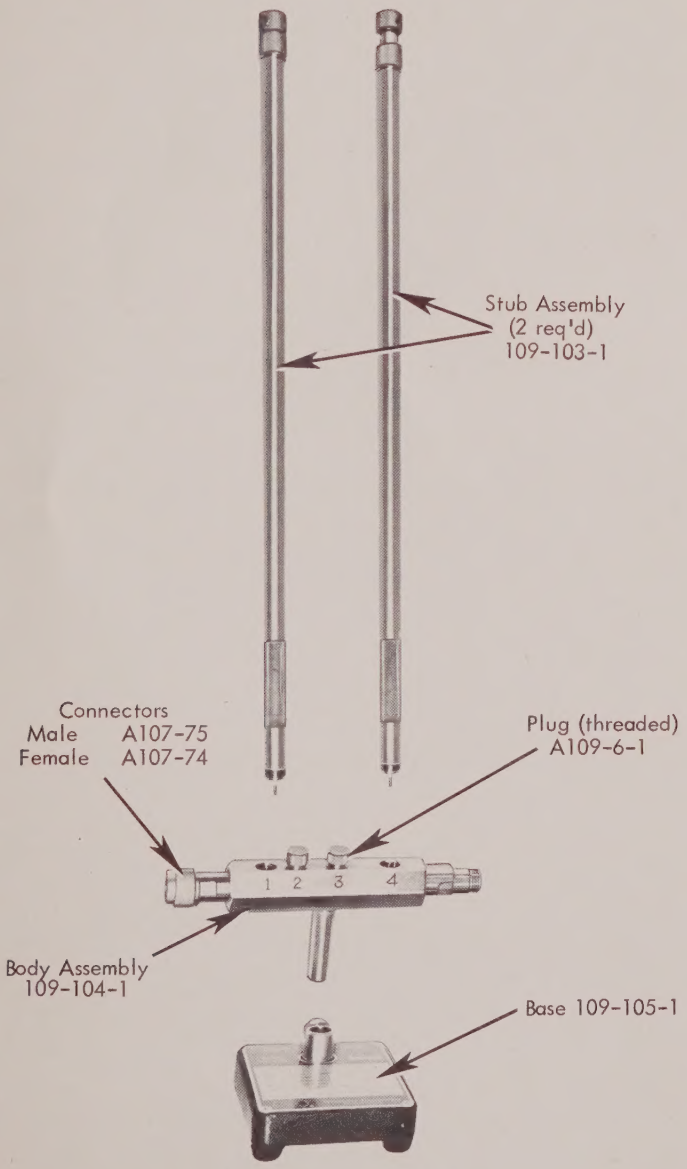
MODEL DS-109 SERIES DOUBLE-STUB TUNERS
EXPLODED VIEW (TYPICAL)



Parts for all Models of the DS-109 Series of Double-Stub Tuners may be ordered direct from Weinschel Engineering, Inc., Gaithersburg, Maryland, 20760. When ordering, BE SURE to include the Model number and the serial number of the tuner for which parts are being ordered.

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